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AN
INAUGURAL ESSAY
ON THE
USE OF ELECTRICITY
IN MEDICINE.
SUBMITTED TO
THE EXAMINATION OF THE
REV. JOHN ANDREWS, D. D. PROVOST
(PRO TEMPORE),
THE
TRUSTEES, AND MEDICAL FACULTY
OF THE
UNIVERSITY OF PENNSYLVANIA,
ON THE 21ST DAY OF APRIL, 1806,
FOR THE
DEGREE OF DOCTOR OF MEDICINE.

BY RICHARD WILLMOTT HALL,
OF MARYLAND,
MEMBER OF THE PHILADELPHIA MEDICAL SOCIETY.

Starts the quick ether through the fibre trains
Of dancing arteries and of tingling veins,
Goads each fine nerve, with new sensation thrill'd,
Bends the reluctant limbs with power unwill'd;
Palsy's cold hands the fierce concussion own,
And life clings trembling on her tottering throne.

BOTANIC GARDEN.

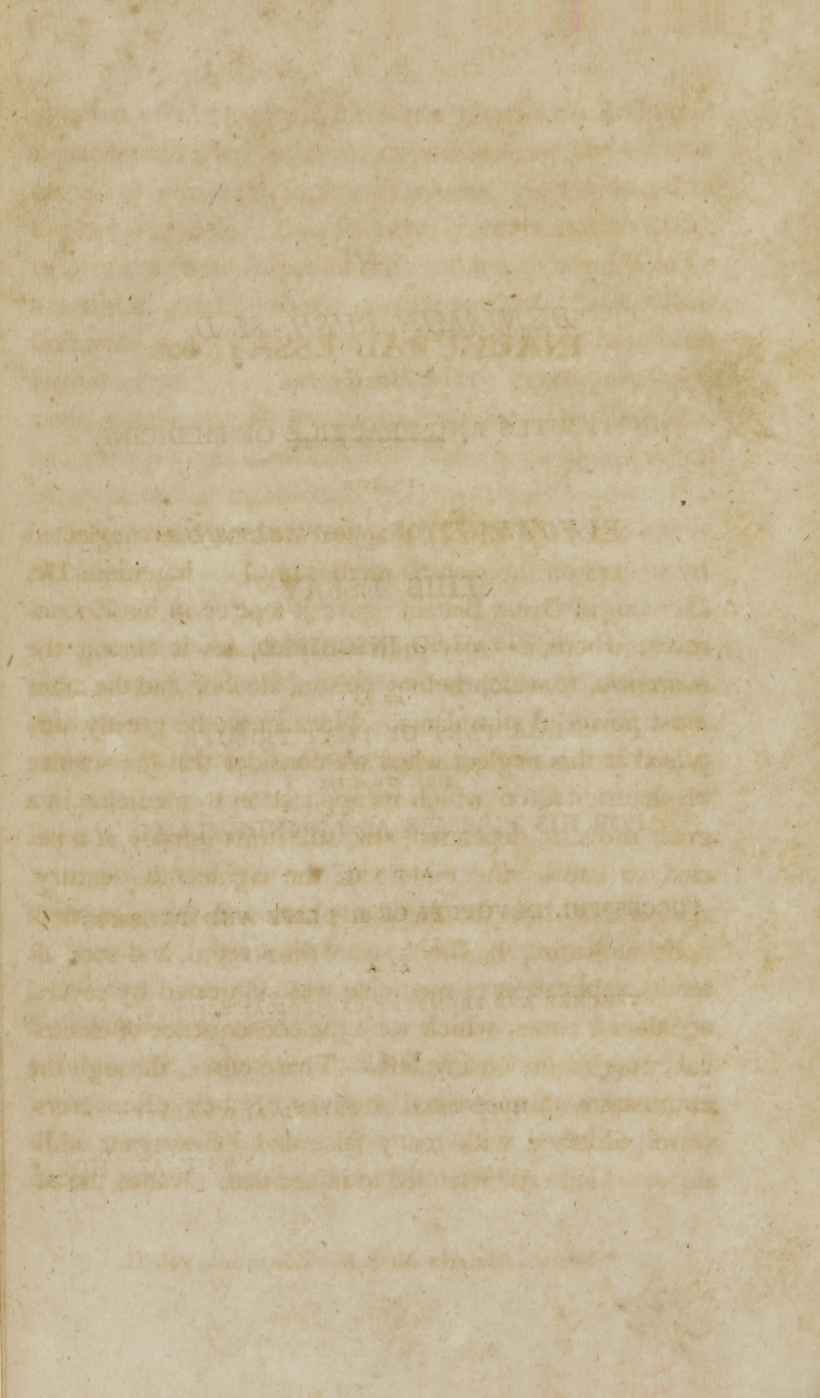
18005

PHILADELPHIA,
PRINTED BY THOMAS AND GEORGE PALMER,
116, HIGH-STREET.

1806.

TO
DOCTOR JACOB HALL,
OF HARFORD COUNTY,
MARYLAND,
THIS INAUGURAL ESSAY IS DEDICATED,
AS A
TESTIMONY OF SINCERE GRATITUDE
FOR THE
MEDICAL AND PATERNAI INSTRUCTION
BESTOWED ON
HIS EVER GRATEFUL AND AFFECTIONATE
SON AND PUPIL,
THE AUTHOR.

TO
BENJAMIN RUSH, M. D.
PROFESSOR OF THE
INSTITUTES AND PRACTICE OF MEDICINE
IN THE
UNIVERSITY OF PENNSYLVANIA,
THIS ESSAY
IS ALSO INSCRIBED,
AS A
SMALL PART OF THAT TRIBUTE
DUE TO HIM
FOR HIS VIRTUES AS AN INDIVIDUAL,
AND THE
SUCCESSFUL DEVOTION OF HIS LIFE AND TALENTS
AS A
TEACHER AND PROMOTER OF MEDICAL SCIENCE,
BY HIS
MUCH OBLIGED FRIEND AND ADMIRER,
THE AUTHOR.



AN
INAUGURAL ESSAY, &c.

ELECTRICITY appears to have been neglected by writers on the materia medica until the ingenious Dr. Darwin, of Great Britain, gave it a place in his *Zoonomia**, where he very judiciously classes it among the *incitantia*, to which belong opium, alcohol, and the other most powerful stimulants. Nor can we be greatly surprised at this neglect when we consider that the science of electricity, on which its application to medicine in a great measure depended, was still in its infancy at a period so late as the middle of the eighteenth century. About that time the Leyden phial, and the manner of communicating the shock, were discovered, and soon after its application to medicine was suggested by several accidental cures, which were the consequence of electrical experiments on invalids. These cures, through the enthusiasm or interested motives of their discoverers, were published with many false and extravagant additions, which rather tended to injure than advance the re-

* See his *Materia Medica*. *Zoonomia*, vol. II.

putation of electricity: for some physicians finding it unsuccessful (perhaps from impatience, or the manner of using) after such high encomiums, were induced to neglect it entirely. But, fortunately, others were willing to give it a more impartial trial, and have shown it to be a useful acquisition to the *materia medica*. Its application and efficacy in the cure of several diseases have been farther suggested and confirmed by the cures from lightning, which our illustrious philosopher, Dr. Franklin, has proven to be identically the same with that excited by an electrical machine.

The want of a more uniform success from the use of electricity, on its first introduction, may, without doubt, be attributed to the entire use of shocks, prescribed without due attention to the state of the system. This opinion seems confirmed by the information of De Haen*, who used it in the hospital of Vienna, in 1756. His patients, who were numerous, joined hands, and received successive electric shocks through their arms and breasts. By using it in this general manner, the cures were protracted much longer, under the same circumstances, than is commonly the case at present. Another disadvantage also attended it: for, among so great a number of patients, there were many so debilitated as to be incapable of sustaining the shocks; and hence, he tells us, that "electricity, although it never did a serious injury, sometimes gave great pain." The experience of electricians has since proved, that, in order to derive more general success from the use of electricity, it

* *Ratio Medendi.*

should be in a great measure regulated by the feelings of the patient : for where it creates great pain, it is not so generally successful.

Philosophers and artists have lately united in improving the machines for exciting the electric fluid. These at present are much more powerful, and more easily managed and kept in repair than formerly. The modes of using electricity are also much varied and improved : we can direct the electric fluid through any part of the body with the greatest safety and convenience ; apply it to the most tender infant without the least injury ; or gradually increase it, to imitate the sudden and fatal effects of the lightning.

The apparatus necessary, in its present improved state, for the practice of medical electricity is very simple, and consists of*

An electrical machine, with an insulated cushion, and prime conductor.

A Leyden jar, and electrometer.

An insulating stool.

A pair of metallic directors with glass handles, to the metallic parts of which wires may be attached when necessary, to electrify the inside of the mouth, &c.

A metallic ball, to draw strong sparks ; a wooden and metallic point, to apply the aura or rays ; two small chains or wires.

With these instruments, electricity may be applied to the body in the following modes :

* In describing the apparatus, &c. I shall use the terms as found in the latest system of electricity.

1st. By *simple* electrification. Place the patient on the insulating stool, and connect him with the prime conductor; when the machine is in motion he will be filled with the electric fluid.

2d. By the electric aura or rays. The patient may be placed on the insulating stool, and connected with the cushion or prime conductor. If with the former, by bringing the point near the patient, while the machine is in motion, the aura will be thrown on him; if with the latter, it is thrown from him to the point. The aura may likewise be thrown on the uninsulated patient by a point connected with the prime conductor, or drawn from him by a point connected with the cushion.

3d. The electric fluid may be conducted, in a continued stream, through any part of the body. By insulating the patient, and applying one of the metallic directors with glass handles, connected with the prime conductor or cushion on one side, and an insulated metallic point on the opposite extremity of the part to be electrified; when the machine is set in motion, the fluid will pass through the part between the director and point.

4th. By sparks. The operator may connect the metallic end of a director with the cushion or prime conductor, and apply it to the patient; or he may insulate the patient, and connect him with the cushion or conductor, and, by holding the metallic ball in his hand, apply the sparks to any part. Smaller sparks may be drawn by an obtuse point.

5th. By electric friction. Connect the patient in either mode, as in the last, and cover the part to be electrified

with flannel. By rubbing the metallic ball lightly over it, small and frequent sparks will be produced*.

6th. By the shock. Connect one metallic director with the electrometer, or inside of a Leyden jar, and the other with the external coating by small chains or wires. The operator taking the directors by the glass handles, applies their metallic balls in such a manner to the extremities, that the shock, in passing from one to the other, may go through the intended part. The discharge of the jar, while the machine is turning, is regulated with great accuracy by the electrometer. The shock may also be received by touching the electrometer, or knob of a charged jar, with one hand, and the external coating with the other.

7th. The charge of a jar may be directed through a part without giving the shock. By connecting one director with the inside of a charged jar, and applying the ball of it to any part of the body of an insulated patient; the fluid will be drawn in a dense, pungent stream in any direction by an uninsulated point on the opposite side. In this manner a patient may be electrified without keeping the machine in motion, or standing in need of an assistant. These seven modes comprise the principal and most essential forms in which electricity can be administered; but the electrician may arrange the apparatus in different situations, &c., as he finds most convenient†.

* The use of positive electricity, or connecting the patient with the prime conductor, will be found most convenient, and will answer every intention of the physician.

† The mode of exciting the machine may be seen in any treatise on electricity.

Simple electrification has been found, by the experiments of many gentlemen, to increase the growth of plants very rapidly, if only applied a short time every day. Seeds, under the same treatment, have also been found to germinate much sooner, *ceteris paribus*, than others. It has also been frequently used as a *succedaneum* for heat, in evolving the chick in ovo. From these circumstances I was induced to suppose, that *simple* electrification might excite a manifest effect on the pulse of a healthy person. This has been asserted by some electricians, and denied by others; but the following experiments render it probable, that the pulse of most healthy persons would be considerably increased in frequency and fulness by this treatment.

Experiment 1. My friend and fellow-graduate, Mr. Claiborne, stood on the insulating stool, and was *simply* electrified. At the expiration of five minutes (the machine still kept in motion) I found his pulse had risen from 80, natural, to 92 strokes in a minute. Standing on the floor, ten minutes after the electricity was discontinued, it returned to 80, natural; it had also considerably increased in fulness while standing on the insulating stool.

Experiment 2. My friend and fellow-graduate, Mr. Creager, stood on the insulating stool, his natural pulse 80, and was simply electrified fifteen minutes. The pulse in five minutes varied to 92, in ten to 100, in fifteen to 96; his pulse became fuller; his face appeared flushed; and a considerable degree of head-ach came on. After discontinuing the electricity, the pulse fell in five minutes to 92, in ten to 84, in fifteen to 80, in twenty

it still remained at 80. The head-ach left him in a short time after the pulse became natural.

Experiment 3. Mr. Claiborne, several hours after the first experiment, again stood on the insulating stool; his pulse 80, and was *simply* electrified ten minutes. The pulse rose in five minutes to 88, in ten to 92; the pulse also became fuller. After standing on the floor, the pulse fell in five minutes to 84, in ten to 80, in fifteen was still 80. These gentlemen were both in good health, when these experiments were made. The electrical machine excited powerfully.

The result of these experiments is, that electricity applied to the healthy body, in the most *simple* manner, has a very considerable stimulant action on the pulse. Perhaps the slowness of the pulse during the night may be owing to a less quantity of atmospheric electricity? The pulse begins to encrease in frequency in the morning, and continues rising until noon. The atmospheric electricity observes the same increase, and, like the pulse, decreases from noon till night. *Simple* electrification has as yet been little used for medical purposes; but in cases of great debility, where a gentle and equable stimulus is required, it may, probably, be used with advantage.

Mr. Birch, surgeon of St. Thomas' Hospital, an ingenious and successful electrician, whose name I shall frequently mention*, considers the electric aura as a sedative. How electricity can be a stimulant and sedative both, is difficult to conceive, for he allows sparks to be

* Adams' Electricity.

highly stimulating. He has probably been led to adopt this opinion from the slight degree of cold produced by the electric aura applied to the skin. But this may be satisfactorily explained when we consider that the evaporation from the part is increased by a current of air set in motion by the passage of the electric fluid.

From many experiments with strong sparks, I have generally found them increase the pulse, on an average, 20 strokes in a minute above the common standard, and, at the same time, it became considerably fuller.

After moderate shocks have been directed through the thorax and extremities, the average increase of the pulse was 25 above the natural standard. The artery, when felt at the wrist, appears to have a convulsive motion. This sudden and increased arterial action produced by sparks and shocks seldom continues more than thirty minutes after the electricity is discontinued. In this respect, electricity resembles some of our well known stimulants, such as opium, camphor, &c., whose stimulant operation, as indicated by the pulse, is so transitory, that, for a long time, these articles were supposed to be sedatives.

Electricians of the present day do not consider it necessary to continue the electricity so long at one time, as was formerly the custom. Eight or ten shocks, or the application of the aura or sparks, ten or fifteen minutes every day, has been found the most eligible mode of using it in chronic cases. In tetanus, &c., where it is necessary to keep up a constant excitement, it should be used, perhaps, every half hour; but, in such cases,

the practitioner will be entirely regulated by circumstances.

Electricity is readily conducted by the fluids of the body. Hence it possesses the advantage over every other article of the *materia medica*, in being applicable to the seat of a disease in any part. I do not mean to propose it, on this account, to the exclusion of other remedies, but, on the contrary, I am of opinion, that, in conjunction or rotation with other stimulants or tonics (for it seems to have a tonic effect), it will be found far more useful than when relied on exclusively. The rule of depleting where there is inflammatory action in the pulse, before the use of stimulants, should likewise be observed in the use of electricity: by this means we render its operation more speedy and certain.

The limits of an inaugural essay will not allow me to detail the cases in which electricity has been used with success. I shall only make a few short extracts, as examples to show its importance and application to the healing art.



USE OF ELECTRICITY.

IN PARALYSIS.

“A man, aged fifty, had a paralysis of his left side fifteen months, which had resisted internal remedies, &c. Electric shocks were daily used, and completed a cure in seven weeks.”

“ A man, aged thirty-nine, after the gout, had a paralysis of his left side, attended with great pain and emaciation.”

“ The most powerful medicines had been used a long time without relief. In two months he was cured by the electric shocks, a little lameness only remaining, for which he refused to continue them.”

“ A woman, aged forty-eight, had a paralysis of her lower extremities, from a fright, of which she was cured without electricity. Both her arms then became paralysed, livid, and cold. After the use of other remedies to no purpose, electric shocks were administered, which, in three months, restored their natural colour, warmth, and activity.”

De Haen, who cured the above cases at the hospital of Vienna, also found * electricity particularly useful in relieving the paralysis and tremors caused by working in lead and mercury.

“ A man from this cause was affected with tremors three years, which, in the last five weeks, became violent, and injured his voice by a paralysis of the tongue. He came to the electric machine daily, and was perfectly cured in less than two months.”

“ A young man had tremors from the same cause four years, which at length caused a paralysis of his extremities, and injured his voice. The electric shocks

restored his speech, and enabled him to resume his occupation in fourteen days.”

“ A man had a paralysis of his inferior extremities three years. Mr. Birch * first used electric frictions daily for a week, and then shocks for the same length of time, but without relief. The aura was applied every day, for a week, with evident advantage, and continued for a month, and had so far relieved him, that he walked by the help of a stick.”

“ Mr. Birch also cured an old man with powerful electric frictions in one month, who had laboured under a hemephlegia three years.”

Dr. James Lind, of Bombay, in a letter to Mr. Cavallo, mentions the cure of a paralysis of the inferior extremities by electricity. “ It came on during the last months of pregnancy, and continued seven months after a safe delivery, in opposition to the usual remedies. On drawing the electric sparks from the inferior extremities a short time, and afterwards passing twenty small shocks from the feet to the pelvis, she could ascend several steps without assistance. A similar application on the succeeding day enabled her to walk out and visit her friends, and the same treatment on the third day completed the cure.”

“ In the first volume of the Philadelphia Medical Museum is an account of a lady in Virginia, who was

* Adams' Electricity.

cured of a paralysis of both arms (the consequence of rheumatism.) by a flash of lightning, which struck her down. After recovering from the shock, she was surprised to find her arms quite free from palsy, and of their natural strength. An eminent physician, among other judicious treatment, had electrified her once a fortnight, or twice a week, for two years, without permanent advantage." Twenty years had expired without a relapse when the case was communicated to professor Rush, by Dr. Thomas Humphreys, of Virginia.

From the success of a strong shock in the last case, would it not be proper, when electricity had been used a considerable length of time, in a moderate manner, without advantage, to try a shock as strong as the patient can bear without injury?

CHOREA SANCTA VITI.

The two following cases of the cure of chorea by electricity are related by De Haen*.

"A girl, twelve years of age, was brought into the hospital at Vienna, who had been a month affected with the chorea to a great degree. Electric shocks completed a cure in five days."

"A girl, who had been formerly affected with the chorea, had a return of it without an evident cause, which resisted the former remedies. She was entirely cured by the electric shocks in twenty-six days."

In the Philosophical Transactions* is an account of a cure of a chorea sancta viti, by electricity, in a letter from Dr. Anthony Fothergill to Mr. Henly. "A girl, ten years of age, of a pale and emaciated appearance, was admitted at Northampton hospital. She had been affected with violent convulsive motions six weeks, with few intermissions, except during sleep. The faculties of the mind were injured, and a total loss of speech had taken place. Volatile and fœtid medicines, warm bath, oxide of zinc, &c. were used a month, without the least advantage. Electric sparks were then drawn from the head, neck, and breast, and a few moderate shocks were passed through the thorax and superior extremities, which gave immediate relief. At two intervals, of eight and ten days, shocks were directed down the spine, and through the inferior extremities, which removed the chorea, and she was discharged in perfect health. Before the use of electricity, she could neither stand nor walk without support." We have no account of the state of the pulse preceding the use of electricity in the above cases of chorea; but this should always be attended to. Professor Barton, in his lectures, informs us, that he prescribed depletion, with complete success, in a case of chorea, where the tonic and stimulant plan had failed; but in the case of a medical student, in this university, who was affected with chorea, tonics always afforded most relief. Hence the necessity of being guided, in the application of electricity in this affection, by the state of the pulse.

IN RHEUMATISM,

The use of electricity must be directed by the pulse, for it will be improper if exhibited while the inflammatory action remains. It is more particularly applicable to the chronic form, or what professor Rush calls rheumaticula: here I have seen it frequently used with great and decided advantage.

IN SPASMODIC AFFECTIONS.

In the winter of 1804, a servant had a rigidity and contraction of the muscles of the face and lower jaw, brought on by a carious tooth, which gradually increased until the jaws were completely closed. I passed several small electric shocks through the masseters and temporal muscles on both sides, and through the face in different directions. The contraction was immediately removed, and the jaws were easily separated. The spasm did not return, and the muscles soon acquired a regular and natural action.

—
“ Mr. Birch removed a contraction of the muscles, which had fixed the lower jaw two years, by a single electric shock. The electricity was continued a few days, and cured the patient completely: he had been discharged from St. Thomas' hospital without relief.”

—
A young man received a blow on his thumb from a hammer, which occasioned violent pain, and threw the flexor muscles of the hand into spasmodic action, after which the fingers were immoveably contracted. He re-

mained in St. Thomas' hospital several weeks, under a variety of treatment, without benefit. Mr. Birch drew the aura through the fore arm by a point, and in five minutes he had the complete use of his fingers. The spasm returned the three following days in a slight degree, but was soon removed by the same treatment. He left the hospital in eight or ten days, perfectly well. By making a great exertion in lifting a hammer, fourteen days after, the spasm again returned, and was relieved by the former treatment: but on drawing some sparks, and passing a few slight shocks through the arm, a violent contraction took place, which required the application of the aura three successive days to overcome; after which he was discharged with the perfect use of his hand.

In the *Philosophical Transactions** is an account of a cure of muscular contraction by electricity, communicated by Mr. Partington to Mr. Henly. "A young lady, in going from a warm room into the cold air, was suddenly seized with a pain in the occiput, which caused a gradual contraction and rigidity of the right mastoideus muscle. By this means the head was inclined over the right shoulder, and the face turned obliquely backwards on the opposite side. She was of an irritable habit, had a weak, quick, irregular pulse, and slight fever in the evenings, when the electricity was applied. In three weeks, by sparks and small shocks, every two or three days, her evening fever left her, the pulse became regular, and she was completely relieved of a disagreeable deformity, under which she had laboured two years."

* Vol. LXVIII.

In the Medical Facts and Observations* is a case of tetanus relieved by electricity, under the direction of Mr. George Wilkins. "Sparks were first used in conjunction with opium, &c. without advantage. Twelve strong shocks were then directed down the spine, which produced a profuse perspiration, and a relaxation of the muscles of the jaw, in ten minutes."

The good effects of electricity in the cure of tetanus are yet but little known; but from the uniform success attending its use, in the few cases of which I have read, and the stimulant power it possesses, I am induced to think, it will be found a remedy of great importance in the treatment of a disease which too often proves fatal.

Professor Rush has proven†, that tetanus and hydrophobia are often produced by the same causes, and are nearly allied in their symptoms. Why should we not expect to derive advantage from electricity in the latter as well as the former? Perhaps, by strong sparks and shocks frequently applied, we might create an action in the system capable of overcoming that produced by the bite of a rabid animal?

IN THE INTERMITTING FORM OF FEVER.

"A man aged 22, had been six months afflicted with an intermittent, by which he was much emaciated; he had taken bark and other medicines without advantage.

* Vol. III.

† Inquiries and Observations.

Mr. Birch applied electric frictions over his stomach and spine, and, one hour previous to the usual appearance of the paroxysm, sparks were drawn through the epigastric region, and different parts of the spine, but the rigor returned as usual. He was then immediately electrified in the same manner, and the rigor ceased in three minutes, but returned again in fifteen. The operation was again repeated, with the same success. Mr. Birch continued the electricity the four succeeding days, and he then took bark, and recovered. Previous to the use of electricity, the bark would not remain on his stomach."

—
 "A maid servant also had an intermittent for a long time, which resisted the bark, &c. After the use of electric sparks, she remained free from paroxysms fourteen days. On exposure they again returned, and Mr. Birch removed them entirely by the sparks."

—
 "A man had an intermittent, which in obstinacy resembled those above-mentioned. Electric frictions over the stomach and spine prevented a return of the paroxysms, and he remained well a month: they then recurred, and were again completely removed, by continuing the frictions a few days."

—
 "Mr. Birch, under whose direction these intermittents were cured, was also attacked by one himself, which proved very obstinate; he was cured by electric frictions over the stomach and spine."

Last autumn, a servant was attacked by an intermittent, for which I used depletion and bark with success, and he remained well ten or twelve days. But, after exposing himself, the paroxysms returned with great violence, and continued in opposition to the former treatment. Having read of Mr. Birch's success in similar cases, I was induced to try the effect of electricity in this. I passed small shocks through the epigastric region to different parts of the spine, and through the extremities, two hours before the expected paroxysm, which completely prevented its return. He took a few doses of bark, and had no relapse.

From its success in these cases, electricity seems likely to be of great advantage in curing the obstinate intermittents of our country, which so often baffle the skill of the physician, and continue several months, to the great injury of the constitution.

IN TYPHUS, OR THE LOW CHRONIC STATE OF FEVER.

We have never seen electricity used in this state of fever; yet, when we consider that it is a stimulus capable of acting when the excitability appears to be entirely exhausted by the action of other stimulants, we cannot doubt its utility in typhus. Shocks, sparks, or electric frictions might be used, either generally or locally, to assist the action of internal stimulants, or blisters and sinapisms to the extremities. The bed may easily be insulated by putting bees-wax, resin, or any non-conducting substance under the posts, and the patient then may be simply electrified, or have the electric fluid drawn in a continued stream through any part of the

body. By these means, when the patient becomes so debilitated as to be incapable of taking his medicine, we might still dispute every inch with death, and, near the crisis, often turn the balance on the favourable side.

IN DISORDERS OF THE VISCERA.

The liver is a viscus particularly liable to disorder, as schirrus, and the formation of calculi in the biliary ducts, &c. These often obstruct the passage of the bile into the duodenum, and a jaundice or yellowness of the skin is generally the consequence.

In the Transactions of the College of Physicians of Philadelphia * is a case, communicated to professor Rush by Dr. Jacob Hall, in which electric shocks were successful in removing biliary calculi from his own person. “ The symptoms were a constant and acute pain in the right hypochondriac region, accompanied by a jaundice. The pain continued, without intermission, several days, when it immediately ceased on directing repeated electric shocks through the liver. The appearance of the fæces and a sudden diarrhœa indicated a free return of bile into the duodenum. The skin soon after acquired its natural appearance.”

This case will suggest the propriety of using electric shocks to procure a discharge of calculi from the ureters, where they not unfrequently lodge in their passage from the kidneys to the bladder, and create great pain.

Does not electricity act, in such cases, merely by stimulating the ducts to take on an action capable of discharging the calculi?

* Vol. I.

Dr. Darwin* also relates a case of a gentleman who had a jaundice six weeks, but without pain, sickness, or fever. "By the doctor's direction he had taken emetics, cathartics, mercury, &c. but to no purpose. On a supposition, that the obstruction of the bile was owing to a torpid action of the biliary ducts, ten smart electric shocks were directed through the liver. On the same day the fæces demonstrated the removal of the obstruction, and the passage of the bile through its natural channel. The shocks were continued a few days more, and his skin gradually became clear." Would not electric shocks rouse the liver into action in hepatalgia, or chronic inflammation of that viscus?

We see a sudden and violent contraction produced in the muscular fibres by an electric shock, and we may conclude, that when applied to the intestines, it will stimulate them in the same manner. Could this sudden and increased action remove an *intersusceptio* of the intestines, before the adhesive inflammation had taken place? As yet no remedy has succeeded in removing this fatal obstruction, but on that account we should be more willing to make trial of electric shocks, which will at least do no injury.

IN OBSTRUCTIONS OF THE CATAMENIÆ.

Among the cases in which electricity was used at the hospital of Vienna, De Haen observed, "that in three instances in which shocks had been used for other complaints, the catamenia were rendered more copious, and

* *Zoonomia*.

continued much longer than usual;" he then asks, "An ergo machina electrica iis adhibenda quæ cum sufficiente quantitate sanguinis et paucos habent et dolorificos menses?" When great pain attends this evacuation, blood-letting will generally be found the most useful in relieving it; after this, electricity may be used with more efficacy.

Dr. Duncan cured a case of amenorrhœa of twenty months continuance*, at the Edinburgh dispensary. "Four small shocks were passed through the pelvis, and repeated three times a week, which had the desired success in a short time." The elixir sacra was also used, but the doctor thinks there is little reason to suppose it capable of removing such an obstinate disorder. On the appearance of a regular habit she was discharged. After several months, she again returned with a paralytic affection of the inferior extremities, in addition to her former complaint. Electricity was again resorted to, which cured the paralysis, and caused a return of the catamenia, but in less quantity than before.

Mr. Birch has so frequently seen the beneficial effects of electricity in such cases, that he considers it one of our most certain remedies for obstructions of the catamenia.

From this effect of electricity we should be guided by great circumspection in its exhibition during pregnancy; shocks should be entirely prohibited in such a state.

IN AFFECTIONS OF THE GLANDS.

Dr. Darwin informs us†, that he has seen indolent scrophulous tumours brought to suppuration, by pas-

* Duncan's Medical Cases.

† Zoonomia.

sing electric shocks through them daily for two or three weeks. They afterwards healed readily.

Mr. Birch cured a child whose death had been predicted by a physician. "The glands of the neck were much enlarged and near suppuration, and from the appearance of the abdomen, those of the mesentery were supposed to be in the same condition. The electric aura was drawn through the abdomen, which soon became soft, and of the natural size. The glands of the neck suppurated and healed readily, by drawing the electric fluid through them, and in two months the child had recovered."

"Dr. Duncan* used electricity in a case of cancerous mamma with relief, but it was discontinued without completing a cure. He was led to use it by the recommendation of Dr. Eason, who had seen a cancerous mamma completely cured by a flash of lightning, which left a black mark on the diseased breast." At present physicians are nearly agreed, that genuine or confirmed cancer will yield to nothing but extirpation; but electricity may probably be used with advantage, in removing the schirrus which often remains after inflammation of the mamma.

Numerous cases of schirrus testes were cured by Mr. Birch with electric shocks; "several of these had been condemned to the knife by eminent surgeons. The

* Medical Cases.

schirrosity was generally removed in a few weeks, and in one instance the secretion was restored." What would be the effect of electricity in removing the bronchocele or goitre, which is becoming so prevalent in some parts of the United States?

IN DISORDERS OF THE EYES,

The exhibition of electricity should at first be of the most gentle kind, as the eye is sometimes too sensible to admit the aura. After the inflammation in ophthalmia is reduced, I have witnessed its success in many instances. It removes the pain and irritation which so often remain after an ophthalmia, strengthens the eye, and renders it capable of bearing the light.

The following interesting cure was communicated to Mr. Cavallo* by Mr. Partington, under whose direction it was performed. "A man of a robust habit had an inflammation of the eyes, which in a week deprived him of sight; he was then sent to the Westminster dispensary, where blood-letting, blisters, and leeches were used two months. The palpebra could only be opened by force, and the coats of the eye appeared of a uniform red colour; with the left he could distinguish colours indistinctly, but with the right, when opposite a window, could only perceive a red glare of light; an excruciating pain was generally felt in the occiput, or near the centre of the eyes. The electric aura was drawn by a delicate metallic point from each eye, and in three days the inflammation had visi-

* Cavallo's Electricity.

bly decreased, but the pupil remained nearly closed. The electricity was continued daily five weeks; the iris gradually expanded, the pain and inflammation left him, and he regained his sight.”

Mr. Cavallo* informs us, that an opacity of the vitreous humour was cured in electricity by one instance, and that the only one of the kind in which he had heard of its use. What would be the effect of electricity in removing an opacity of the crystalline lens?

Professor Rush informed me, “that Dr. Cullen, in his lectures, mentioned the case of a gentleman in Europe, who had a temporary return of vision, of which he had been deprived by a gutta serena, after a stroke from lightning. But at that time the identity of lightning and electricity was not discovered, and hence the completion of a cure, which nature had begun, was unfortunately neglected.” Would not electricity relieve a gutta serena? This case certainly suggests the propriety of making the experiment.

IN ERYRIPELAS.

“Mr. Lovett relates a case† in which he used electricity with success, when the erysipelatous inflammation was so great, that at first sight he despaired of any good effect; about the middle of the day he placed the patient on the insulating stool, and drew small sparks from

* Cavallo's Electricity, 3d vol.

† Electricity Rendered Useful.

him ; before night the swelling was much abated, and in a few days entirely disappeared.” Did the electric sparks act like a blister in this case ? What would be the effect of electricity in stopping the progress of mortification ?

IN TINEA CAPITIS.

In the spring of 1805, a man applied to me with an eruption in the greatest part of his head, with which he informed me he had been afflicted eighteen months. It first began on the crown of the head, from which it extended gradually over the scalp, removing the hair in its progress, and leaving large deep scabs which gave considerable pain, and were extremely disagreeable in appearance. Its progress was not alone confined to the scalp, it had also taken possession of the greatest part of the face, and had attacked and removed the ciliæ from the eye-lids, leaving them in such a state of inflammation as to cause partial blindness ; a variety of applications had been used with so little success, that he almost despaired of a cure. He was placed on the insulating stool, and strong sparks were drawn from the scalp and face, and the aura from the eyes. This treatment, thrice repeated, with intervals of several days, completed a cure. The scabs dried and fell off, and the scalp and face became smooth. The inflammation from the palpebræ was removed, and in a short time he regained the full enjoyment of his sight.

I have known several instances in which very troublesome and disagreeable affections on other parts of the body were removed by a single application of the elec-

tric sparks. They appeared to be of the nature of *tinea capitis*.

“ Professor Physick, in his lectures, observes, that an affection of this nature not unfrequently attacks the *palpebræ*, and proves very troublesome.” Electricity would perhaps be a safer remedy for this than lunar caustic, which is sometimes used?

The power of electricity in the cure of diseases is yet but little known. The subject still presents an extensive field for the cultivation of the physician. Perhaps the remedy for epilepsy, which has so anxiously been sought for in vain by physicians, through the vegetable and mineral kingdoms, is at all times in the atmosphere surrounding our bodies. The analogy of the action of electricity in the human body, with that of some other stimulants which have been useful in epilepsy, does not render this an improbable conjecture. It will not be difficult to put it to the test of experiment. Too many unfortunate subjects are met with, on which it might be tried, if not with advantage, I can almost venture to say without the least injury.

Hitherto the progress of electricity has been greatly retarded by confining it to chronic diseases, but the improvements in medicine have now directed us to extend its utility much farther, and apply it in recent cases with greater advantage. There are, without doubt, many instances in which it has been unsuccessfully used, or a few where it has even been injurious; but

these are no arguments against it. No one certainly would lay aside the use of bark or opium, because, when prescribed in improper doses, or without due attention to the pulse, they have been useless or injurious ; or do we always find them successful, even when exhibited in the most judicious manner, or under the most favourable circumstances?

But the efficacy of electricity has been acknowledged in the greater number of cases in which it has been used ; in many of these it was adopted only as a last resource, after every mode of treatment had been attended to, which the skill or ingenuity of physicians could devise.

The advantages to be derived from electricity must increase according to the convenience with which patients can receive its application. In cities, hospitals, and public dispensaries, where a great number are collected within a small circle, it may be applied extensively, and with great convenience. The variable state of electricity in the atmosphere, and the uncertainty of bringing it into action, have been urged as objections to a reliance upon it ; but the latter is, in a great measure, hypothetical*, for I have seen but few days, even during the warmest seasons of the year, in which a quantity of the electric fluid, sufficient for medical purposes, could not be collected. By keeping the machine in good order, and chusing the middle of the day, when the atmospheric electricity is generally in the greatest plenty, the electrician will seldom be disappointed. Even when

* Mr. Volney, in his View of America, asserts, that the atmosphere of the United States is always much higher charged with electricity than that of Europe.

the quantity of the electric fluid as excited by the machine is so small as scarcely to affect an electrometer, by warming the air of the room by a fire, or placing a chafing-dish of hot coals at a little distance from the machine, to drive off the moisture, and warm the air moderately, a powerful excitation will generally be produced.



OF THE MODUS OPERANDI.

Electricity may truly be considered the most sudden and powerful stimulus with which we are acquainted. But the manner in which it exerts this stimulant action on the body is still unknown. From the great mechanical effects which are often caused by it, some persons have been induced to explain its action on the body by the same principle. But this is rendered improbable from many circumstances. Animals, when destroyed by powerful electric shocks, expire without a struggle, and the muscular contractility is destroyed in a moment. But no mechanical violence which only destroys life can prevent the expiring struggles of an animal, or exhaust the contractile power of the muscles in so short a time. The bodies of animals which are killed by electricity soon run to putrefaction. On the contrary, when life is destroyed by sudden mechanical violence, this process is retarded.

The coagulation of the blood always takes place after sudden death from mechanical violence; but, after death

from electricity, the blood is invariably dissolved. Is this dissolution of the blood caused by the muscular action before death, or by a primary effect of the electricity upon it? The latter opinion seems most probable: for, in death from electricity, the muscular action is instantaneously destroyed. The experiments of Dr. Caldwell also support this opinion; for he found that strong electric shocks prevented the coagulation of the blood*.

Electricity seems to have a greater affinity or determination to the nervous system than to any other. This same determination to particular systems may also be observed in many articles of the *materia medica*. Stramonium affects the brain in a greater degree; mercury the glandular or lymphatic system; oil of amber the muscles; and the fœtid gums, like electricity, the nerves. But there is so intimate a connection and dependance of the systems in the human body upon each other, that, when one is excited into action, the others always sympathise more or less with it. Electricity also affects the muscular, arterial, and glandular systems to a great degree. It seems capable of acting while the smallest spark of excitability remains; and hence possesses the advantage of giving relief when every other stimulant has failed. But we can only explain the good effects of it in curing disease by the law of Mr. Hunter: “it creates a new action, capable of overcoming and removing a diseased one.”

* Caldwell on the Vitality of the Blood.

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